

2010

A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group

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Recommended Citation

Grills, I. S.; Hope, A. J.; Guckenberger, M.; Kestin, L. L.; Werner-Wasik, M.; Yan, D.; Sonke, J. J.; Bissonnette, J. P.; Xiao, Y.; and Belderbos, J. (2010) "A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group," *Bodine Journal*: Vol. 3 : Iss. 1 , Article 32.

DOI: <https://doi.org/10.29046/TBJ.003.1.031>

Available at: <http://jdc.jefferson.edu/bodinejournal/vol3/iss1/32>

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Background

Published lung SBRT outcomes/dose response data for inoperable NSCLC come from small phase I-II studies or larger datasets not requiring image-guided radiotherapy (IGRT) or volumetric prescriptions. This entire cohort of SBRT patients had daily online cone-beam CT.

Materials/Methods

Four-hundred-thirty-four (434) cases of Stage I (T1-2N0M0) NSCLC were treated with SBRT via VIGRT at 1/5 institutions from 1998-2009. Median age was 74y (42-92); 53% male, 47% female. Median FEV1 was 1.4L (65% predicted); median DLCO was 9.8 ml/min/mmHg (54% predicted). Sixty-two percent (62%) of tumors were biopsy-proven; 84% of cases were staged with CT and PET. Clinical stage was IA in 76%, IB in 22%, locally recurrent in 1%. Median max tumor dimension was 2.4cm (0.9- 8.5cm). Histologies were: 41% adenocarcinoma, 34% squamous, 12% large cell, 13% NSCLC. NOS. 8%, 51%, and 42% were grades 1, 2, 3. Median volumetric prescription dose (PD) was 54Gy (20-64Gy) delivered in median of 3 fractions (fx) (1-15fx) over 8d (1-27d). Median biological equivalent PD (BED₁₀) was 132Gy (60-180Gy), equal to 2-Gy fx equivalent (FE) of 110Gy (50-150Gy). Corresponding GTV and PTV mean doses (2-GyFE) were 157Gy and 137Gy. Mean follow-up was 1.3y (0.1-7.3y).

Results

2-y Kaplan-Meier rates of local recurrence (LR), regional recurrence (RR) and distant metastasis (DM) were 8%, 13%, and 26%. Two year overall survival(OS) and cause-specific survival(CSS) were 58% and 84%. No statistically significant differences in LR, RR, DM, OS or CSS were identified for biopsied vs. non-biopsied tumors. On univariate analysis, stage (IA 5% v IB 16%, p=0.002), GTV max dimension (<2.7cm

4% v ≥2.7cm 12%, p=0.006), and 2-GyFE PD (<88Gy 17% v ≥88Gy 5%, p<0.001) predicted LR. GTV (<115Gy 32% v ≥115Gy 4%, p<0.001) and PTV (<105Gy 24% v ≥105Gy 4%, p<0.001) mean doses also predicted LR. Cox multiple regression confirmed the relationship between PD and LR, independent of GTV size (p=0.01).

Conclusion

This is the first Lung SBRT dataset of patients treated uniformly with daily online VIGRT and resulted in excellent local control for Stage I NSCLC. A 2-GyFE dose of 88 Gy predicted superior local control.